

**PSYCHOLOGICAL AND CLINICAL CORRELATES OF POSTTRAUMATIC GROWTH IN
CANCER. A SYSTEMATIC AND CRITICAL REVIEW.**

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Abstract

Objective: To describe major findings on posttraumatic growth (PTG) in cancer, by analyzing its various definitions, assessment tools, and examining its main psychological and clinical correlates.

Methods: A search in relevant databases (PsycINFO, Pubmed, ProQuest, Scopus and Web of Science) was performed using descriptors related to the positive reactions in cancer. Articles were screened by title, abstract and full-text. **Results:** Seventy-two met the inclusion criteria. Most articles (46%) focused on breast cancer, used the Post-traumatic Growth Inventory (76%), and had a cross-sectional design (68%). PTG resulted inversely associated with depressive and anxious symptoms, and directly related to hope, optimism, spirituality and meaning. Illness-related variables have been poorly investigated compared to psychological ones. Articles found no relationship between cancer site, cancer surgery, cancer recurrence and PTG. Some correlations emerged with the elapsed time since diagnosis, type of oncological treatment received and cancer stage. Only few Studies differentiated illness-related life threatening stressors from other forms of trauma, and the potentially different mechanisms connected with PTG outcome in cancer patients. **Conclusions:** The evaluation of PTG in cancer patients is worthy, since it may promote a better adaption to the illness. However, many investigations do not explicitly refer to the medical nature of the trauma, and they may have not completely captured the full spectrum of positive reactions in cancer patients. Future research should better investigate issues such as health attitudes; the risks of future recurrences; and the type, quality, and efficacy of medical treatments received and their influence on PTG in cancer patients.

Keywords: cancer, oncology, assessment tool, benefit finding, review, benefit finding, posttraumatic growth.

Cancer has been considered a potentially traumatic event by the DSM-IV. Authors have begun to investigate cancer-related PTSD symptoms and other adjustment issues, together with possible positive consequences associated to the cancer diagnosis. The oncological illness could be perceived as traumatic since the diagnosis itself has a seismic nature in patient's life and the course of the illness activates a sense of vulnerability and mortality awareness that are indeed the core characteristics of any traumatic events.

Tedeschi & Calhoun pioneered the study of possible positive consequences deriving from traumatic events, and suggested that the shattering of basic assumptions in life and the awareness of own vulnerabilities could trigger a process of self-maturation labeled as post-traumatic growth (PTG).

PTG results out of a struggle in the aftermath of a trauma which generates a cognitive recognition of improvements in individuals' personal strengths and spirituality, in their relationships with others, and in the appreciation of their own life. . Tedeschi & Calhoun's [1] model has been the dominant one in trauma research and its related assessment tool has been used to evaluate the coexistence of PTG and PTSD in trauma survivors. A recent meta-analyses on this issue [2] described an inverted U shape relationship between PTG and PTSD, where a balanced level of distress may trigger PTG, but at greater PTSD severity PTG decreases. This pattern characterized most of traumatized population, with the exception of survivors of medical illnessess, where this quadratic association was weak [2].

This finding introduces the question whether PTG might be the best model to capture positive reactions following medical related trauma, and their beneficial consequences in terms of mental health.

However, other definitions have been suggested to identify such positive responses, but they seem to present some relevant conceptual differences that need to be taken into account:

The concept of *positive psychological changes* was used to describe benefits reported by traumatized individuals who feel that they can communicate more openly with others, can experience fewer fears, are less preoccupied with life's difficulties, and rearrange their life priorities. Another widely used construct is *benefit finding* (BF), referring to the short term benefits obtained from the adverse

experience. BF, in fact, is more prone to emerge just in the close aftermath of an adversity, while PTG tends to appear after a certain amount of time since trauma.

A distinction should also be done between *meaning-making* and PTG. The first is a way of changing individuals' view of life in order to integrate what has happened and to give the event an existential value in the persons' life framework. Therefore, meaning refers to the process of understanding how the event fits in ones' life.

Similarly, the concept of *sense of coherence (SOC)* underlines the importance of making sense for adverse life circumstances and it incorporates three features: manageability, comprehensibility and meaningfulness of the event. The concept of *resilience* is defined with similar terms, and underlined that it refers to the capability of maintaining stable levels of psychological functioning when being exposed to a potentially stressful event, especially when it lasts for a long period of time, as the case of chronic illnesses and cancer. Finally, *thriving* has also been used as a synonym of PTG, but psychological thriving results from a continued growth and gains in one or more important psychosocial areas, like personal relationships, self-confidence, and life skills. Thus, it would be something more than PTG, being the result of growth and an increased well-being (WB).

In sum, substantial differences have been found among the definitions of positive constructs that emerge out of a potentially adverse event. Accordingly, several measurement tools have been developed and used interchangeably to assess the diverse positive reactions to trauma, as indicated in Table 1.

Moreover, when it comes to illness related-trauma, there is no clear consensus regarding the specific clinical characteristics that define these positive reactions, and their beneficial consequences, in terms of physical and mental health. PTG and its related concepts, in fact, derived from psychological trauma research, and not from psychosomatic or medical fields of investigation. These considerations may be particularly relevant for psycho-oncology for two main reasons. First, cancer is the preferred life threatening medical condition that has been studied in terms of growth, meaning, and spirituality, up to date. Secondly, psycho-oncology entails the consideration of psychological as well as medical

variables associated to the illness. Thus, psycho-oncology would require a careful examination of possible positive reactions to the illness, considering both psychological and clinical correlates.

Hence, the main aim of this systematic and critical review of the existing literature is to analyze the findings obtained in terms of clinical and psychological correlates of PTG in cancer. We chose to give priority to the model proposed by Tedeschi and Calhoun (PTG) for many reasons. First of all, it is the prevailing one in current trauma research. Nevertheless, the question whether it might be the best model to capture positive reactions in *medical* trauma remains unanswered [2]. Moreover, the model of PTG encompasses various components (i.e., spiritual, cognitive, interpersonal). Thus, among the various models described above, PTG inventory may be the most appropriate to capture a wider range of positive responses following a cancer illness, in terms of interpersonal, psychological, and spiritual changes. However, we included other similar concepts and assessment tools in order to be as much inclusive as possible in identifying the psychological and clinical correlates of PTG in cancer.

Methods

Literature search strategy

Electronic literature searches were performed using Medline, PsycINFO, Web of Science, Scopus, and Proquest Psychology Journals databases using relevant review terms: *posttraumatic growth, benefit finding, personal growth, positive psychological changes, stress-related growth, positive posttrauma outcomes, positive posttrauma life changes, meaning*, sense of coherence, adversial growth, thriving, positive reappraisal, resilience* combined with *cancer* and with *assessment, tool, inventory, measure, questionnaire, excluding review, metaanalysis* and *case report*. There was no restriction on the year of publication. Search was performed using subject headings, keywords, titles and abstracts (up to October 2016). PRISMA criteria were followed.

Study selection criteria

The following selection criteria were applied on the articles found in databases:

Type of studies

Published primary studies were eligible for inclusion; reviews, editorials, letters, and case reports were excluded. No limitations regarding study designs were used. Language of the articles included was English. Articles that validated assessment tools were also considered, as could include cancer patients.

Type of participants

We included only studies where the participation of cancer patients or survivors was clearly specified in the title, the abstract or keywords. There were no restrictions regarding the age or the number of participants, neither the stage of their disease. We also included articles with samples composed by cancer patients and other chronic diseases.

Posttraumatic growth – related constructs

We selected the articles when the assessment of PTG and the related constructs was specified in title, in the abstract or in the keywords, including: BF, personal growth, meaning, positive psychological changes, stress-related growth, positive posttrauma outcomes, positive posttrauma life changes, sense of coherence, adversarial growth, thriving, positive reappraisal, resilience. Those articles that clearly did not refer to PTG, but only to other terms were excluded after the full-text screening. Articles not reporting medical and psychological/psychiatric data were excluded.

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Review methods

The abstracts of the identified records were screened for relevance. Articles were rejected if they failed to meet the selection criteria. When an abstract could not be rejected with certainty, the full article was appraised. A review template was developed specifying key details for each study (see

Table 1). Details were extracted by one reviewer and results were commented with the other reviewers. Discrepancies were resolved by consensus. The methodological quality of the studies was appraised using specific tools for quantitative [3], mixed-methods [4], and qualitative [5] designs (see Table 1). No studies were rejected from the final analysis for low methodological quality (see Table 1).

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Results

After removing duplicates, 2,205 articles were screened by title from 5 databases. Articles were excluded if: 1. did not assess PTG-related terms; 2. were not focused on patients or survivors of cancer (e.g. they were focused on careers or family members); 3. were not empirical articles; 4. were not in English; 5. were not focused on cancer disease, or did not include participants with a cancer illness, as illustrated in Figure 1. The final articles included by full-text in this review were 72 and are reported in Table 1. In this Table, articles are grouped according to the label(s) and tool(s) used when referring to PTG, beginning with PTG alone, and adding subsequent labels and tools. Categories “a” to “d” collect articles focused on PTG, that assessed it with Tedeschi and Calhoun’ PTGI; with PTGI plus other questionnaires or qualitative methods; or that assessed PTG with tools other than PTGI, respectively. Categories “e” and “f” collect articles generically referring to growth, or personal growth, which was measured with PTGI or other tools, respectively. Categories “g” and “h” group articles referring to BF, which was assessed it with the Benefit Finding Scale (BFS), or with tools other than BFS. Finally, categories “i-j-k” group articles focused on meaning, and assessed it with Meaning in Life scale (MiLS), with the PTGI, or with tools other than MiLS, respectively. In each of these groups, articles are alphabetically ordered.

The subsequent tables (Table 2 and Table 3) present a subanalysis that shows in detail the outcome found among studies concerning illness-related characteristics (Table 2), the relationships between PTG and psychological aspects, including psychiatric conditions and other positive dimensions such as optimism, hope, or meaning (Table 3).

Of the 72 articles reviewed, 46% were addressed to breast cancer only, and 39% included samples of patients with various cancer diagnoses. The remaining articles included samples with only colorectal cancer, others with head/neck cancer, prostate or testicular cancer, and leukemia.

Most studies (68%) had a cross-sectional design, while the remaining 32% used a longitudinal design. In addition, most articles assessed PTG in a specific moment of the illness, and/or confronted cancer patients' PTG to those of healthy controls, of siblings, or of other type of traumatic event survivors.

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Instruments for assessing positive reactions in cancer

Most investigations (76%) adopted the model of Tedeschi and Calhoun [1] for analyzing the positive psychological changes occurring in the aftermath of cancer. The majority of the articles that relied on this model assessed it using the PTG inventory (PTGI) assessment tool, alone or together with other similar tools. Further, as displayed in Table 1, some articles referred to Tedeschi and Calhoun's definition of PTG, but used different tools to assess it, such as the Silver Lining questionnaire, the Perceived Benefits scales, or qualitative methods. Similarly, BF was assessed with the BFS, but also with PTGI and other instruments, such as Stress-Related Growth Scale, Positive Contributions Scale or qualitative methods (categories *g* and *h* in Table 1). Thus, these articles present a certain degree of disagreement in their methodologies. Poor concordance between the main focus of research and the methodology used may represent a risk of outcome bias in the investigations.

Consequently, the results among these investigations were not always concordant, especially concerning the correlations between PTG levels and medical or psychiatric characteristics of cancer patients (see Table 2 and Table 3).

PTG and Illness-related characteristics

The articles reporting relationships between clinical data and PTG are 38, but only 18 were explicitly looking for these relationships. Among these, different areas were explored, including characteristics related to the type of cancer, the type of treatment received, and also the time elapsed since the

traumatic experience. In general, *illness-related characteristics* were poorly related to PTG (see Table 2). Articles found no relationship between cancer site, cancer surgery, cancer recurrence and PTG. Other investigated variables are the elapsed time since diagnosis, type of oncological treatment received and cancer stage. They all presented inconsistent findings:

Time since diagnosis and treatment

Nearly all the six articles that analyzed the relationship between time since treatment and PTG found no relationship, except for two [6,7]. Barakat et al. [6], used a different assessment tool rather than PTGI, and found an inverse relationship between these two variables. Ransom et al. [7] assessed the modification of PTG before and after radiotherapy in breast and prostate cancer patients and found a direct relationship between time since treatment and PTG. Another similar variable is *time since diagnosis*; and either no relationship or a direct relationship between this variable and PTG emerged (see Table 2). Thus, elapsed time since diagnosis and treatment seems to be unrelated to the occurrence of PTG. However, the definition of PTG itself highlights the importance of time for the development of PTG. Therefore, as the large majority of the articles studying this aspect used the PTGI, this questionnaire might lack of sensitivity in analyzing the passing of time and the emerging of PTG in oncological patients.

Oncological treatment

Regarding the *type of oncological treatment received*, some discrepancies were found. Most articles (10 out of 16) reported no relationship between this variable and PTG. The remaining ones found a direct relationship between undergoing chemotherapy and PTG compared to no chemotherapy, radiotherapy or their combination, respectfully [8–10]. In regards to radiotherapy, one study (which used the Persian version of PTGI) found a direct relationship between PTG and this treatment versus chemotherapy or surgery [11]; while another one found an inverse relationship as compared to surgery [12].

Cancer stage

Concerning *cancer stage*, results were also equally divided. Six out of the 10 articles reported no association; the remaining 40% documented a direct relationship. These discrepancies appear to be particularly relevant and basically independent from the assessment tool used. Only few Authors [13–15] actually stressed out the importance of differentiating illness-related, life threatening stressors from other forms of trauma, and the potentially different mechanisms connected with PTG outcome.

PTG and psychiatric conditions

Twenty-six articles investigated this issue. Ten of them did specifically focus on the relationship between PTG and psychiatric conditions such as anxiety, depression, or stress, between others (see Table 3). The remaining articles were focused on the evaluation of positive functioning and, in addition, assessed psychiatric symptoms in cancer patients.

Anxiety and depression

Most articles (18 out of 26) evaluated the levels of anxiety and depression, and 11 of these 18 studies found no relationship with PTG (see Table 3). Only two [16,17] reported an inverse relationship between anxiety symptoms and PTG. In the case of depression, four out of nine articles found an inverse relationship between this variable and PTG [18–21]. However, two of these three articles [18,19] used the Personal Growth Initiative Scale rather than PTGI. The third [20], assessed PTG in cancer patients in a palliative care setting. The last one [21] used the PTGI in German long-term survivors of adolescent cancer. Finally, Danhauer et al. [22] found a direct relationship between depressive symptoms and PTG, suggesting that the more depressive symptoms, the more reflexive the women became and, thus, the more PTG emerged. Therefore, the heterogeneity in the assessment methodology could explain such inconsistent findings.

Posttraumatic stress disorder, distress, negative rumination

The relationship between Posttraumatic Stress Disorder (PTSD) or Posttraumatic Stress Symptoms (PTSS) and later PTG development in cancer was investigated by eleven studies. No consensus on the results were found, five articles [21,23–26] showing no relationship; and the remaining six, reporting a direct relationship. None of these studies reported data on the quadratic relationship between PTG and PTSD, rather, they focused on the linear one [2]. Higher consensus was observed regarding distress and PTG: two out of six articles found no relationship between these variables [27,28], while the other found an inverse relationship. Finally, negative rumination was studied by only three articles: two of them found no relationship with PTG [23,24], while the third [14] found an inverse relationship. However, the assessment of PTG was done using the Benefit Finding Scale in this last article.

Also for psychiatric variables associated with PTG, findings seem to be inconclusive due to heterogeneity in assessing methods. Thus, correlations between psychiatric conditions and PTG need to be more accurately investigated in future research with cancer patients.

PTG and other positive constructs

We evaluated the relationship between PTG and other *positive constructs* such as meaning, optimism, WB, hope and gratitude, between others (see Table 3). These were analyzed by 35 articles, nearly the half (N=16) of them being explicitly focused on studying these relationships. Articles documented a direct relationship between PTG and these positive constructs in oncological patients. However, spiritual and psychological WB, gratitude and happiness were studied only in few articles compared to meaning, optimism, hope and positive affect. Specifically, when considering optimism, the results were discrepant, since half of the articles documented a direct relationship, the remaining ones found no relationship, and one article found pessimists to display greater PTG [29]. The same pattern of relationship was also observable for PTG and positive affect; PTG and quality of life; and PTG and hope.

The area where more consensus emerged was the one concerning meaning, which was often linked with PTG, positive reappraisal or other positive coping styles. Thus, according to the literature examined, meaning-making process seems to be a direct path leading to PTG [14,15,30–35]. Different from other positive dimensions (such as optimism, hope and positive affect), existential dimensions in individuals life (such as meaning and meaning making processes) seem to be more consistently linked to PTG in cancer patients. Accordingly, when PTG was measured together with, or by using instruments evaluating meaning, it seems that more converging areas of positive changes in dealing with cancer have been detected. Hence, findings examined in this review tend to be more concordant and conclusive.

Discussion

The present review was aimed at analyzing the clinical and psychological correlates of PTG in patients diagnosed and treated for oncological illness. An evaluation of the measurement tools used to assess this construct and the concordance with their theoretical definition was also performed.

The limitations of this review of the literature concern the heterogeneity of the populations included (different cancer types, stages, age of participants, etc.), the selection of articles written only in English available as full text, and the inclusion of various psychometric instruments. Considering that PTG research is rapidly growing, we may have omitted in press or more recent investigations, where full text was not available, yet.

A total of 72 relevant articles were analyzed. Most of them included breast cancer patients, referred to Tedeschi & Calhoun's [1] definition of PTG, and used The Posttraumatic Growth Inventory as the main assessment tool, alone or in combination with other scales (see Table 1).

Interestingly, most of the 72 articles were published in multidisciplinary or psychological databases/journals (see Figure 1). This observation may suggest that PTG is particularly investigated by clinical psychologists and less explored in medical journals. The articles found in medical databases mostly reported stress and other related physical reactions during cancer, not providing a specific emphasis on PTG. This observation may have clinical implications, since researchers, nurses

and physicians working in oncological settings may not be sufficiently aware of the possible positive psychological reactions to the illness experienced by their patients. Further, the distribution of publications in this review on PTG and its clinical correlates suggest that psychosocial concomitants of cancer still remain confined to humanistic and social sciences, without fully embracing the medical ones.

A second observation concerns the fact that researchers and clinicians have evaluated phenomena as PTG, BF, meaning, personal growth, thriving, resilience, etc. and subsumed them under the broad umbrella of positive reactions to the illness. As a result, research is still inconclusive in identifying clinical predictors, correlates and mediators of PTG in this domain as highlighted by Tables 1 to 3.

By a methodological viewpoint, the use of one or another assessment tool when measuring PTG can lead to diverse results. Although most articles clearly refer to Tedeschi & Calhoun [1] definition in their abstracts and introductions, sometimes researchers used another assessment tool. For example, Barakat et al. [6] assessed PTG using an interview with dicotomic and Likert scales not based on Tedeschi and Calhoun's definition of PTG, which encompasses five specific domains. Other articles, like the one by Rand, et al. [28] used an opposite approach: they were aimed at assessing positive psychological responses using Tedeschi and Calhoun's PTG Inventory, but not basing on their model. Yanez, et al. [36] and Park, et al. [14] were aimed at assessing the cancer-related growth and PTG, respectively, but then used the Benefit Finding Scale (Table 1). The choice of one or another questionnaire might have conditioned the emergence of specific variables that better fitted with the tool itself. Indeed, these investigations yield a relevant risk of outcome bias.

Further, the discrepancies between PTG definition and the assessment tool(s) used are not the only emerging problems, but the definition of PTG itself in cancer should be also examined. Specifically, while most articles distinguished PTG from other constructs, some others did not. For example, some authors considered PTG and BF as synonyms (e.g.[11,33]) and they used the PTGI, the BFS or the Stress-Related Growth Scale. In other articles, authors did not distinguish between PTG, BF and

meaning (e.g. [37,38]), and used the PTGI to assess all of them. Again, the risk of outcome bias is present also in these cases.

Very few articles, however, were aimed at providing a specific definition of positive psychological reactions following a cancer illness [6,8,39–41] and their peculiar characteristics. Rather, it seems that researchers and clinicians applied the constructs of PTG, BF, resilience or thriving, that originally derived from research on war, natural disasters or other type of trauma, to the cancer settings. This may have contributed to generate confusing and often inconsistent findings, which do not provide full and valid descriptions of positive reactions triggered by an oncological illness.

A notable exception among these confusing results may be represented by investigations focused on meaning and its association with PTG. As described in the introduction, although distinguishable, these two concepts share commonalities and similar pathways in identifying positive trajectories following cancer. For instance, according to Park et al. [15], growth could be considered a final outcome of meaning-making process as well as a direct ingredient in restoring life meaning (Table 3). These robust overlaps between meaning and growth were documented by other articles examined in this review (Table 3): some articles considered PTG and meaning as synonyms [37,38,42–44] or one being a pathway to reach the other [30–32]. Thus, when considering the various proposed definitions of positive reactions following cancer, the two that basically displayed more commonalities and less discrepant results across investigations are Tedeschi and Calhoun's PTG and meaning models (Table 3). However, the model of meaning was poorly investigated in association with cancer clinical correlates, where the majority of the studies used PTGI or BF (see Table 2).

According to traditional psychosomatic and psycho-oncology approach, illness-related variables should have an influence on patients' psychological reactions and adaptation to the medical condition. Nevertheless, in case of cancer and PTG, the only clinical variable displaying some correlations seems to be time since diagnosis/treatment. According to Tedeschi and Calhoun's definition, PTG needs time to appear in the aftermath of a traumatic event. Thus, a positive correlation should have emerged, but some of our findings do not provide confirmation of this statement, even when the PTGI

was used (see Table 3). Further, the authors state that the intensity and severity of the stress should be directly related to PTG. However, most of the investigations documented no significant relationship between severity of illness, stage, and type of treatment received.

The same discrepancies were also documented in the relationship with psychiatric conditions where, for example, PTG was inversely or not related to depression, to negative intrusions and worries, to distress, and to anxiety (Table 3). PTSD or PTSS were the only psychiatric conditions that displayed a direct relationship with PTG in cancer populations. However, confirming Shakespeare-Finch meta-analyses [2], the inverted U shape pattern of relationship between PTG and PTSD is not reported in these investigations, since Authors did not usually evaluate quadratic correlations between PTG and PTSD.

More homogeneous results were found when evaluating the relationships between PTG and other positive psychological resources, such as, spiritual and psychological WB, happiness and gratitude.

However, other positive domains, such as hope, optimism, quality of life and positive affect displayed a controversial pattern of correlations among investigations involving cancer patients (Table 3). These findings confirm Tedeschi and Calhoun definition of PTG, which encompasses the presence of positivity and distress at the same time. In cancer settings, however, this phenomenon seems to be more complex and mediated by other variables, such as type of clinical populations, and assessment tools used.

We suggest that a possible explanation for the discrepancies found in this review relies on that Tedeschi and Calhoun's model of PTG was originally conceptualized as a description of positive changes after traumatic events, not necessarily considering their medical nature. Edmondson [45] suggested to differentiate the nature and characteristics of PTSD when it is triggered by life threatening illnesses, as opposed to other type of trauma. The Author proposed the Enduring Somatic Threat (EST) model of PTSD due to acute life-threatening medical events, which underlines the differences in symptom manifestations when due to acute manifestations of chronic and severe disease that are enduring/internal in nature. In cancer, the illness experience has a nuanced onset (it

often begins with routine screening examinations); it continues through cancer diagnosis and treatments (that may be long-lasting and invasive) and it goes on for many years with the fear of future recurrences. However, the specificities of the medical nature of the trauma are not assessed by the 21 items of the PTGI.

Conclusions

Tedeschi and Calhoun PTG is the most used model to describe positive psychological changes following a cancer illness. PTG resulted inversely associated with depressive and anxious symptoms, and directly related to hope, optimism, spirituality and meaning. Thus, it seems worthy to evaluate and promote PTG in cancer patients for better adaption to the illness.

However, PTG entails a direct relationship with PTSD and PTSS symptoms in cancer, which do not confirm the quadratic correlations emerging in other traumatic events [5]. Future research is needed to solve these inconsistent findings.

Cancer-related variables resulted scarcely and inconsistently associated with PTG, probably because the PTGI does not explicitly refer to the medical nature of trauma. Thus, Tedeschi and Calhoun model may not be completely adequate to capture the full spectrum of positive reactions in cancer.

Future research could benefit from the inclusion of the Enduring Somatic Threat (EST) model towards the development of PTG, as opposed to PTSD. Similarly, the inclusion of a questionnaire measuring the fear of cancer recurrences could shed new lights on the development of PTG, according to the illness characteristics and individual psychological reactions.

In the medical context, a complexity of issues may influence the manifestation of PTG, which current research has often neglected. This critical review documents that more detailed and extended research is needed to describe the full spectrum of positive psychological changes from cancer experience and their time trajectories.

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References

- 1 Tedeschi RG, Calhoun LG. Posttraumatic Growth: Conceptual Issues. In: Calhoun LG, Tedeschi RG, eds. *Positive Changes in the Aftermath of Crisis*. Mahwah: Lawrence Erlbaum Associates, Inc. Publishers;1998:1–22
- 2 Shakespeare-Finch J, Lurie-Beck J. A meta-analytic clarification of the relationship between posttraumatic growth and symptoms of posttraumatic distress disorder. *J Anxiety Disord* 2014;28:223–229. doi:10.1016/j.janxdis.2013.10.005
- 3 Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* 1998;52:377–84. doi:10.1136/jech.52.6.377
- 4 Pluye P, Robert E, Cargo M, et al. Proposal: A mixed methods appraisal tool for systematic mixed studies reviews. *Montréal McGill Univ* 2011:1–8
- 5 Kmet LM, Lee RC, Cook LS. Standard Quality Assessment Criteria for Evaluating Primary Research Papers. *HTA Initiat* 2004;13. ISSN: 1706-7855
- 6 Barakat LP, Alderfer MA, Kazak AE. Posttraumatic growth in adolescent survivors of cancer and their mothers and fathers. *J Pediatr Psychol* 2006;31:413–419 doi:10.1093/jpepsy/jsj058
- 7 Ransom S, Sheldon KM, Jacobsen PB. Actual change and inaccurate recall contribute to posttraumatic growth following radiotherapy. *J Consult Clin Psychol* 2008;76:811–819. doi:10.1037/a0013270
- 8 Hefferon K, Grealay M, Mutrie N. Transforming from cocoon to butterfly: The potential role of the body in the process of posttraumatic growth. *J Humanist Psychol* 2009;50:224–247. doi:10.1177/0022167809341996
- 9 Jansen L, Hoffmeister M, Chang-Claude J, et al. Benefit finding and post-traumatic growth in long-term colorectal cancer survivors: prevalence, determinants, and associations with quality of life. *Br J Cancer* 2011;105:1158–1165. doi:10.1038/bjc.2011.335
- 10 Lelorain S, Bonnaud-Antignac A, Florin A. Long term posttraumatic growth after breast cancer: Prevalence, predictors and relationships with psychological health. *J Clin Psychol Med Settings* 2010;17:14–22. doi:10.1007/s10880-009-9183-6
- 11 Rahmani A, Mohammadian R, Ferguson C, et al. Posttraumatic growth in Iranian cancer patients. *Indian J Cancer* 2012;49:287–292. doi:10.4103/0019-509X.104489
- 12 Mols F, Vingerhoets AJ, Coebergh JW, et al. Well-being, posttraumatic growth and benefit finding in long-term breast cancer survivors. *Psychol Health* 2009;24:583–95. doi:10.1080/08870440701671362
- 13 Vail KE, Juhl J, Arndt J, et al. When death is good for life: considering the positive trajectories of terror management. *Pers Soc Psychol Rev* 2012;16:303–29. doi:10.1177/1088868312440046
- 14 Park CL, Chmielewski J, Blank TO. Post-traumatic growth : finding positive meaning in cancer survivorship moderates the impact of intrusive thoughts on adjustment in younger adults. 2010;19:1139–1147. doi: 10.1002/pon.1680
- 15 Park CL, Edmondson D, Fenster JR, et al. Meaning making and psychological adjustment following cancer: the mediating roles of growth, life meaning, and restored just-world beliefs. *J Consult Clin Psychol* 2008;76:863–75. doi:10.1037/a0013348

- 16 Wang AW, Chang C, Chen S, et al. Identification of posttraumatic growth trajectories in the first year after breast cancer surgery. *Psychooncology* 2014;23:1399-1405. doi:10.1002/pon.3577
- 17 Canavarro MC, Silva S, Moreira H. Is the link between posttraumatic growth and anxious symptoms mediated by marital intimacy in breast cancer patients? *Eur J Oncol Nurs* 2015;19:673-679. doi:10.1016/j.ejon.2015.04.007
- 18 Morrill EF, Brewer NT, O'Neill SC, et al. The interaction of post-traumatic growth and post-traumatic stress symptoms in predicting depressive symptoms and quality of life. *Psychooncology* 2008;17:948-53. doi:10.1002/pon.1313
- 19 Morrill EF. Posttraumatic stress, quality of life, depression, and physical health in cancer survivors: The buffering effect of posttraumatic growth. 2012;73:626
- 20 Olden ME. Posttraumatic growth in cancer patients at the end of life: An exploration of predictors and outcomes. 2009;70:7216
- 21 Gunst DCM, Kaatsch P, Goldbeck L. Seeing the good in the bad: which factors are associated with posttraumatic growth in long-term survivors of adolescent cancer? *Support Care Cancer* 2016;24:4607-4615. doi:10.1007/s00520-016-3303-2
- 22 Danhauer SC, Russell G, Case LD, et al. Trajectories of Posttraumatic Growth and Associated Characteristics in Women with Breast Cancer. *Ann Behav Med* 2015;49:650-9. doi:10.1007/s12160-015-9696-1
- 23 Widows MR, Jacobsen PB, Booth-Jones M, et al. Predictors of posttraumatic growth following bone marrow transplantation for cancer. *Heal Psychol* 2005;24:266-73. doi:10.1037/0278-6133.24.3.266
- 24 Salsman JM, Segerstrom SC, Brechting EH, et al. Posttraumatic growth and PTSD symptomatology among colorectal cancer survivors: A 3-month longitudinal examination of cognitive processing. 2009;41:30-41. doi:10.1002/pon
- 25 Nenova M, DuHamel K, Zemon V, et al. Posttraumatic growth, social support, and social constraint in hematopoietic stem cell transplant survivors. *Psychooncology*. 2013;22:195-202. doi:10.1002/pon.2073
- 26 Tillery R, Howard Sharp KM, Okado Y, et al. Profiles of Resilience and Growth in Youth With Cancer and Healthy Comparisons. *J Pediatr Psychol* 2016;41:290-297. doi:10.1093/jpepsy/jsv091
- 27 Schroevers MJ, Teo I. The report of posttraumatic growth in Malaysian cancer patients: relationships with psychological distress and coping strategies. *Psychooncology* 2008;17:1239-1246. doi:10.1002/pon.1366
- 28 Rand KL, Cripe LD, Monahan PO, et al. Illness appraisal, religious coping, and psychological responses in men with advanced cancer. *Support Care Cancer* 2012;20:1719-1728. doi:10.1007/s00520-011-1265-y
- 29 Turner-Sack AM, Menna R, Setchell SR, et al. Posttraumatic growth, coping strategies, and psychological distress in adolescent survivors of cancer. *J Pediatr Oncol Nurs* 2012;29:70-79. doi:10.1177/1043454212439472
- 30 Costa RV, Pakenham KI. Associations between benefit finding and adjustment outcomes in thyroid cancer. *Psychooncology* 2012;21:737-744. doi:10.1002/pon.1960

- 31 Jim HS, Andersen BL. Meaning in life mediates the relationship between social and physical functioning and distress in cancer survivors. *Br J Health Psychol* 2007;12:363–381. doi:10.1348/135910706X128278
- 32 Jim HS, Purnell JQ, Richardson SA, et al. Measuring meaning in life following cancer. *Qual Life Res* 2006;15:1355–1371. doi: 10.1007/s11136-006-0028-6
- 33 Labelle LE, Lawlor-Savage L, Campbell TS, et al. Does self-report mindfulness mediate the effect of Mindfulness-Based Stress Reduction (MBSR) on spirituality and posttraumatic growth in cancer patients? *J Posit Psychol* 2014;10:153–166. doi:10.1080/17439760.2014.927902
- 34 Ruini C, Vescovelli F, Albieri E. Post-traumatic growth in breast cancer survivors: new insights into its relationships with well-being and distress. *J Clin Psychol Med Settings* 2013;20:383–391. doi:10.1007/s10880-012-9340-1
- 35 Svetina M, Nastran K. Family Relationships and Posttraumatic Growth in Breast Cancer Patients. *Psychiatr Danub* 2012;24:298–306. PMID: 23013636
- 36 Yanez B, Edmondson D, Stanton AL, et al. Facets of spirituality as predictors of adjustment to cancer: Relative contributions of having faith and finding meaning. *J Consult Clin Psychol* 2010;77:730–741. doi:10.1037/a0015820
- 37 Heinrichs N, Zimmermann T, Huber B, et al. Cancer distress reduction with a couple-based skills training: a randomized controlled trial. *Ann Behav Med* 2012;43:239–252. doi:10.1007/s12160-011-9314-9
- 38 Bower JE, Meyerowitz BE, Desmond KA, et al. Perceptions of positive meaning and vulnerability following breast cancer: Predictors and outcomes among long-term breast cancer survivors. *Ann Behav Med* 2005;29:236–45. doi:10.1207/s15324796abm2903_10
- 39 Brunet J, McDonough MH, Hadd V, et al. The Posttraumatic Growth Inventory: an examination of the factor structure and invariance among breast cancer survivors. *Psychooncology* 2010;19:830–8. doi:10.1002/pon.1640
- 40 Jaarsma TA, Pool G, Sanderman R, et al. Psychometric properties of the Dutch version of the posttraumatic growth inventory among cancer patients. *Psychooncology* 2006;15:911–20. doi:10.1002/pon.1026
- 41 Zebrack B. Developing a new instrument to assess the impact of cancer in young adult survivors of childhood cancer. *J Cancer Surviv* 2009;3:174–80. doi: 10.1007/s11764-009-0087-0
- 42 Fleer J, Hoekstra H, Sleijfer DT, et al. The role of meaning in the prediction of psychosocial well-being of testicular cancer survivors. *Qual Life Res* 2006;15:705–717. doi:10.1007/s11136-005-3569-1
- 43 Penedo FJ, Molton I, Dahn JR, et al. A randomized clinical trial of group-based cognitive-behavioral stress management in localized prostate cancer: Development of stress management skills improves quality of life and benefit finding. *Ann Behav Med* 2006;31:261–270. doi:10.1207/s15324796abm3103_8
- 44 Wang Y, Zhu X, Yang Y, et al. What factors are predictive of benefit finding in women treated for non-metastatic breast cancer? A prospective study. *Psychooncology* 2015;24:533–539. doi:10.1002/pon.3685
- 45 Edmondson D. An Enduring Somatic Threat Model of Posttraumatic Stress Disorder Due to

Acute Life-Threatening Medical Events. *Soc Personal Psychol Compass* 2014;8:118–34. doi:10.1111/spc3.12089

- 46 Silva S, Moreira HC, Canavarro MC. Examining the links between perceived impact of breast cancer and psychosocial adjustment: The buffering role of posttraumatic growth. *Psychooncology* 2012;21:409–18. doi:10.1002/pon.1913
- 47 Cormio C, Romito F, Giotta F, et al. Post-traumatic growth in the Italian experience of long-term disease-free cancer survivors. *Stress Heal* 2013;31:189–196. doi:10.1002/smi.2545
- 48 Yi J, Kim MA. Postcancer experiences of childhood cancer survivors: how is posttraumatic stress related to posttraumatic growth? *J Trauma Stress* 2014;27:461–467. doi:10.1002/jts.21941
- 49 Cordova MJ, Giese-Davis J, Golant M, et al. Breast Cancer as Trauma: Posttraumatic Stress and Posttraumatic Growth. *J Clin Psychol Med Settings* 2007;14:308–319. doi:10.1007/s10880-007-9083-6
- 50 Jones SMW, Ziebell R, Walker R, et al. Psychometric investigation of benefit finding among long-term cancer survivors using the Medical Expenditure Panel Survey. *Eur J Oncol Nurs* 2016;20:31–35. doi:10.1016/j.ejon.2015.07.005
- 51 Bellizzi KM, Blank TO. Predicting posttraumatic growth in breast cancer survivors. *Heal Psychol* 2006;25:47–56. doi:10.1037/0278-6133.25.1.47
- 52 Bellizzi KM, Smith AW, Reeve BB, et al. Posttraumatic growth and health-related quality of life in a racially diverse cohort of breast cancer survivors. *J Health Psychol* 2010;15:615–626. doi:10.1177/1359105309356364
- 53 Cohen M, Numa M. Posttraumatic growth in breast cancer survivors: A comparison of volunteers and non-volunteers. *Psychooncology* 2011;20:69–76. doi:10.1002/pon.1709
- 54 Mystakidou K, Tsilika E, Parpa E, et al. Personal growth and psychological distress in advanced breast cancer. *Breast* 2008;17:382–386. doi:10.1016/j.breast.2008.01.006
- 55 Tallman B, Shaw K, Schultz J, et al. Well-being and posttraumatic growth in unrelated donor marrow transplant survivors: a nine-year longitudinal study. *Rehabil Psychol* 2010;55:204–210. doi:10.1037/a0019541
- 56 Weiss T. Correlates of Posttraumatic Growth in Married Breast Cancer Survivors. *J Soc Clin Psychol* 2004;23:733–746. doi:10.1521/jscp.23.5.733.50750
- 57 Gianinazzi ME, Rueegg CS, Vetsch J, et al. Cancer's positive flip side: posttraumatic growth after childhood cancer. *Support Care Cancer* 2016;24:195–203. doi:10.1007/s00520-015-2746-1
- 58 Sears SR, Stanton AL, Danoff-Burg S. The yellow brick road and the Emerald City: Benefit-finding, positive reappraisal coping, and posttraumatic growth in women with early-stage breast cancer. *Heal Psychol* 2003;22:487–497. doi:10.1037/0278-6133.22.5.487
- 59 Manne SL, Ostroff J, Winkel G, et al. Posttraumatic growth after breast cancer: Patient, partner, and couple perspectives. *Psychosom Med* 2004;66:442–454. doi:10.1097/01.psy.0000127689.38525.7d
- 60 Danhauer SC, Russell GB, Charlotte UNC, et al. A longitudinal investigation of posttraumatic growth in adult patients undergoing treatment for acute leukemia. *J Clin Psychol Med Settings* 2013;20:13–24. doi:10.1007/s10880-012-9304-5.A

- 61 Pat-Horenczyk R, Perry S, Hamama-Raz Y, et al. Posttraumatic Growth in Breast Cancer Survivors: Constructive and Illusory Aspects. *J Trauma Stress* 2015;28:214–222. doi:10.1002/jts.22014
- 62 Aflakseir A, Nowroozi S, Mollazadeh J, et al. The Role of Psychological Hardiness and Marital Satisfaction in Predicting Posttraumatic Growth in a Sample of Women With Breast Cancer in Isfahan. *Iran J Cancer Prev* 2016;9:7–11. doi:10.17795/ijcp-4080
- 63 Morris BA, Shakespeare-Finch J, Scott JL. Posttraumatic growth after cancer: the importance of health-related benefits and newfound compassion for others. *Support Care Cancer* 2012;20:749–756. doi:10.1007/s00520-011-1143-7
- 64 Silva S, Crespo C, Canavarro MC. Pathways for psychological adjustment in breast cancer: A longitudinal study on coping strategies and posttraumatic growth. *Psychol Health* 2012;27:1323–1341. doi:10.1080/08870446.2012.676644
- 65 Andrykowski MA, Bishop MM, Hahn EA, et al. Long-term health-related quality of life, growth, and spiritual well-being after hematopoietic stem-cell transplantation. *J Clin Oncol* 2005;23:599–608. doi:10.1200/JCO.2005.03.189
- 66 Abdullah MFL, Jaafar NRN, Zakaria H, et al. Posttraumatic growth, depression and anxiety in head and neck cancer patients: Examining their patterns and correlations in a prospective study. *Psychooncology* 2015;24:894–900. doi:10.1002/pon.3740
- 67 Mystakidou K, Parpa E, Tsilika E, et al. Traumatic distress and positive changes in advanced cancer patients. *Am J Hosp Palliat Care* 2007;24:270–276. doi:10.1177/1049909107299917
- 68 Schroevers MJ, Helgeson VS, Sanderman R, et al. Type of social support matters for prediction of posttraumatic growth among cancer survivors. *Psychooncology* 2010;19:46–53. doi:10.1002/pon.1501
- 69 McDonough MH, Sabiston CM, Wrosch C. Predicting changes in posttraumatic growth and subjective well-being among breast cancer survivors: The role of social support and stress. *Psychooncology* 2014;23:114–120. doi:10.1002/pon.3380
- 70 Ruini C, Vescovelli F. The role of gratitude in breast cancer: Its relationships with post-traumatic growth, psychological well-being and distress. *J Happiness Stud* 2012;14:263–274. doi:10.1007/s10902-012-9330-x
- 71 Liu J, Wang H, Wang M, et al. Posttraumatic growth and psychological distress in Chinese early-stage breast cancer survivors: A longitudinal study. *Psychooncology*. 2014;23:437–443. doi:10.1002/pon.3436
- 72 Moore AM, Gamblin TC, Geller DA, et al. A prospective study of posttraumatic growth as assessed by self report and family caregiver in the context of advanced cancer. *Psychooncology*. 2011;20:479–487. doi:10.1002/pon.1746
- 73 Lethborg C, Aranda S, Cox S, et al. To what extent does meaning mediate adaptation to cancer? The relationship between physical suffering, meaning in life, and connection to others in adjustment to cancer. *Palliat Support Care* 2007;5:377–388. doi:10.1017/S1478951507000570
- 74 Sherman AC, Simonton S, Latif U, et al. Effects of global meaning and illness-specific meaning on health outcomes among breast cancer patients. *J Behav Med* 2010;33:364–377. doi:10.1007/s10865-010-9267-7
- 75 Bözo O, Gündoğdu E, Büyükasik-Colak C. The moderating role of different sources of

perceived social support on the dispositional optimism-- posttraumatic growth relationship in postoperative breast cancer patients. *J Health Psychol* 2009;14:1009–1020. doi:10.1177/1359105309342295

- 76 Lelorain S, Tessier P, Florin A, et al. Posttraumatic growth in long term breast cancer survivors: relation to coping, social support and cognitive processing. *J Health Psychol* 2012;17:627–639. doi:10.1177/1359105311427475
- 77 Yu Y, Peng L, Tang T, et al. Effects of emotion regulation and general self-efficacy on posttraumatic growth in Chinese cancer survivors: assessing the mediating effect of positive affect. *Psychooncology* 2014;23:473–478. doi: 10.1002/pon.3434
- 78 Yuen ANY, Ho SMY, Chan CKY. The mediating roles of cancer-related rumination in the relationship between dispositional hope and psychological outcomes among childhood cancer survivors. *Psychooncology* 2014;23:412–419. doi:10.1002/pon.3433
- 79 Danhauer SC, Case LD, Tedeschi R, et al. Predictors of posttraumatic growth in women with breast cancer. *Psychooncology* 2013;**22**:2676–2683. doi:10.1002/pon.3298

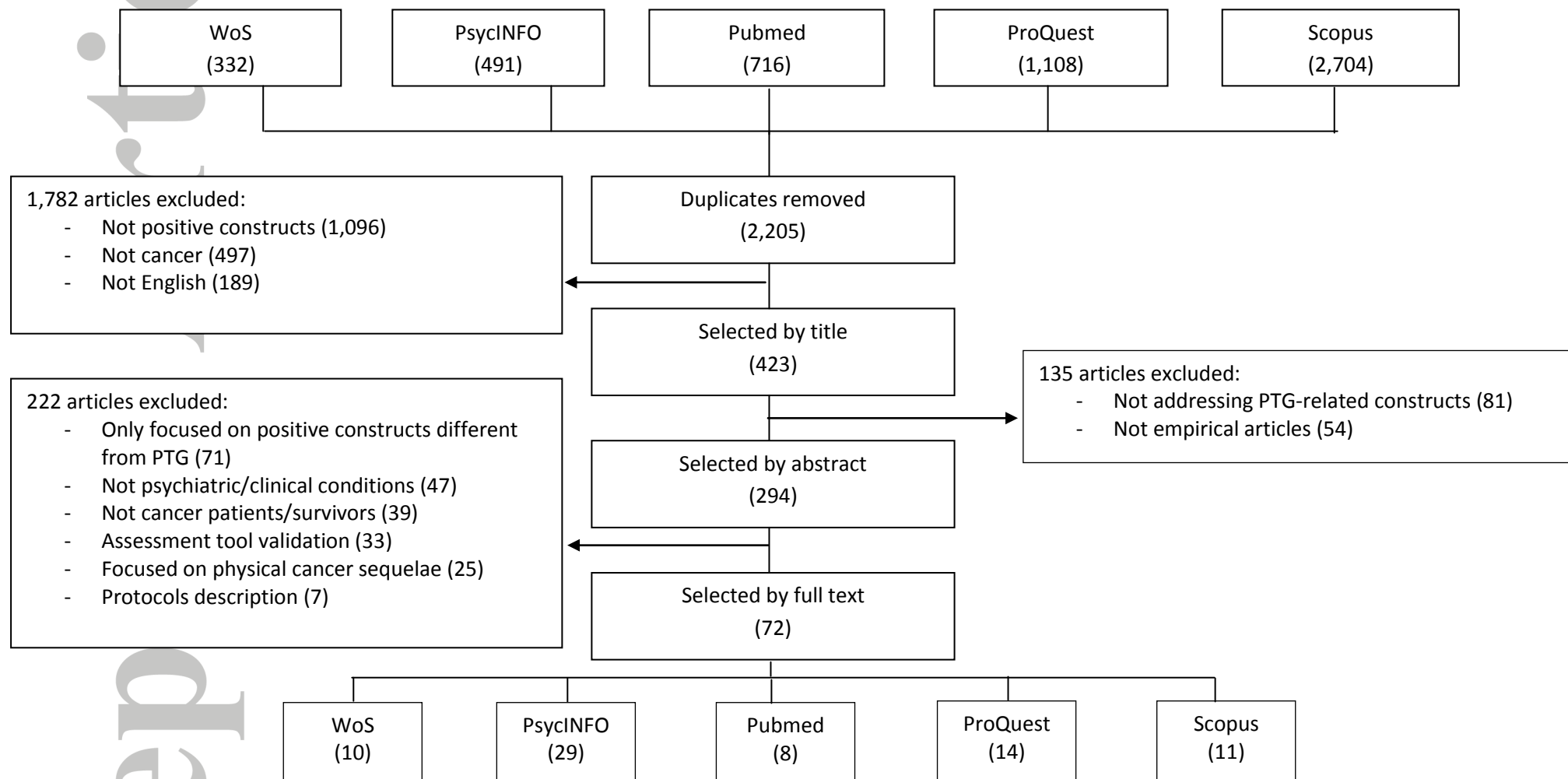


Figure 1

Table 2. Illness characteristics related or not to PTG

	Reference number	Tool/label	Type of relationship between the illness characteristic and PTG
Cancer site	[23]	PTG – PTGI	0
	[46]	PTG – PTGI	0
	[47]	PTG – PTGI	0
	[48]	PTG – PTGI	0
	[15]	Personal Growth (PG)– Perceived Benefits Scale (PBS)	0.
Cancer stage	[23]	PTG – PTGI	0
	[49]	PTG-PTGI	0
	[24]	PTG – PTGI	0
	[16]	PTG – PTGI	0
	[22]	PTG – PTGI	0
	[50]	Positive changes – Medical Expenditure Panel Survey (MEPS)	0
	[51]	PTG – PTGI	+
	[12]	PTG – PTGI; Benefit finding (BF) – Impact of Event Scale (IES)	+

	[52]	PTG – PTGI	+
	[9]	PTG – PTGI; BF – Benefit Finding Scale (BFS)	+
Cancer surgery	[51]	PTG – PTGI	0
	[7]	PTG – PTGI	0
	[39]	PTG – PTGI	0
	[53]	PTG – PTGI	0
	[46]	PTG – PTGI	0
	[16]	PTG – PTGI	0
	[50]	Positive changes – MEPS	0
Cancer treatment	[23]	PTG – PTGI	0
	[54]	PTG – PTGI	0
	[7]	PTG-PTGI	0
	[24]	PTG – PTGI	0
	[39]	PTG – PTGI	0
	[55]	Anticipated PTG – PTGI	0
	[46]	PTG – PTGI	0
	[29]	PTG – PTGI	0

	[47]	PTG – PTGI	0
	[16]	PTG – PTGI	0
	[10]	PTG – PTGI	+ chemotherapy – PTG
	[8]	PTG – Qualitative methods	+ chemotherapy – PTG
	[9]	PTG – PTGI; BF – BFS	+ chemotherapy – PTG
	[22]	PTG – PTGI	+ chemotherapy – PTG
	[11]	PTG – PTGI	+ radiotherapy – PTG
	[12]	PTG – PTGI; BF – IES	- radiotherapy – PTG
Time since diagnosis	[56]	PTG – PTGI; BF – <i>ad hoc</i> questionnaire	-
	[48]	PTG – PTGI	-
	[57]	PTG – PTGI	-
	[21]	PTG – PTGI	-
	[58]	PTG – PTGI; BF – qualitative methods	+
	[59]	PTG – PTGI	+
	[9]	PTG – PTGI	+
	[55]	Anticipated PTG - PTGI	+
	[60]	PTG – PTGI	+
	[61]	PTG – PTGI	+

	[62]	PTG – PTGI	+
	[51]	PTG – PTGI	0
	[54]	PTG – PTGI	0
	[20]	PTG – PTGI; BF – BFS	0
	[24]	PTG – PTGI	0
	[39]	PTG – PTGI	0
	[10]	PTG – PTGI	0
	[52]	PTG – PTGI	0
	[63]	PTG – PTGI	0
	[64]	PTG – PTGI	0
	[29]	PTG – PTGI	0
	[47]	PTG – PTGI	0
	[50]	Positive changes – MEPS	0
Time since treatment	[23]	PTG – PTGI	0
	[65]	Growth – PTGI	0
	[39]	PTG – PTGI	0
	[29]	PTG – PTGI	0
	[6]	PTG – ITSIS	-

	[7]	PTG – PTGI	+
Recurrence	[20]	PTG – PTGI; BF – BFS	0
	[48]	PTG – PTGI	0
	[21]	PTG – PTGI	0

*Note: 0 = no statistically significant relationship ; + = direct and statistically significant relationship ; - = inverse and statistically significant relationship.

Table 3. Psychiatric and positive dimensions related or not to PTG

	Reference number	Tool/Label	Type of relationship between psychiatric/positive dimensions and PTG
Anxiety	[66]	PTG – PTGI	0
	[40]	PTG – PTGI	0
	[67]	PTG – PTGI	0
	[68]	PTG – PTGI	0
	[24]	PTG-PTGI	0
	[21]	PTG – PTGI	0
	[9]	PTG – PTGI	0
	[17]	PTG – PTGI	-
	[16]	PTG – PTGI	-
PTSS/PTSD/stress	[23]	PTG – PTGI	0
	[24]	PTG – PTGI	0
	[25]	PTG – PTGI	0
	[21]	PTG – PTGI	0
	[26]	PTG – BFS	0

	[58]	PTG – PTGI; BF – qualitative methods	+
	[6]	PTG – Impact of Traumatic Stressors Interview Schedule	+
	[54]	PG/PTG – PTGI	+
	[18]	PTG – PTGI	+
	[69]	PTG – PTGI	+
	[48]	PTG – PTGI	+
Distress	[68]	PTG – PTGI	0
	[28]	PTG – PTGI	0
	[23]	PTG-PTGI	-
	[70]	PTG – PTGI	-
	[71]	PTG – PTGI	-
	[21]	PTG – PTGI	-
	[9]	PTG – PTGI	-
Concerns about life/disease/negative intrusions	[23]	PTG – PTGI	0
	[24]	PTG – PTGI	0
	[14]	PTG – BFS	-
Depression	[18]	PTG – PTGI	-
		PG - Personal Growth Initiative Scale (PGIS)	

	[20]	PTG – PTGI	-
	[19]	PTG – PTGI and PGIS	-
	[66]	PTG – PTGI	0
	[68]	PTG – PTGI	0
	[24]	PTG – PTGI	0
	[72]	PTG – PTGI	0
	[16]	PTG – PTGI	0
	[22]	PTG – PTGI	+
Meaning	[38]	Positive meaning/growth - PTGI	+
	[30]	BF –The Stress-Related Growth Scale (SRGS) and PTGI.	+ (BF as a pathway to achieve meaning)
	[32]	Meaning in life – Meaning in Life Scale (MiLS).	+ (PTG is included into meaning)
	[31]	Meaning in life – MiLS	+ (PTG is included into meaning)
	[42]	PTG – SRGS –; Meaning in life –The Life Regard Index	Expressive writing enhanced both PTG/BF and meaning.
	[33]	PTG – PTGI	Both meaning and PTG can be increased using mindfulness skills.
	[15]	Growth – PBS	+
	[14]	PTG – PTGI	Both meaning and PTG were related to better WB.

	[34]	PTG – PTGI	Both meaning and PTG directly related to gratitude.
	[35]	PTG –PTGI	+ (Meaning as a part of PTG)
	[73]	PTG – PTGI	0 between
	[59]	PTG – PTGI	0
	[74]	Global and illness-related meaning – Sense of Coherence Scale	0
	[36]	Cancer-related growth - PTGI	0 related growth
	[38]	Meaning – <i>ad hoc</i> positive meaning scale and PTGI.	Consider PTG and meaning as synonyms.
	[42]	Meaning –Life Regard Index, and two qualitative questions	Consider PTG and meaning as synonyms.
	[37]	PTG/BF/meaning –PTGI	Consider PTG and meaning as synonyms.
	[43]	BF/PTG/meaning - Positive Contributions Scale	Consider PTG and meaning as synonyms.
	[44]	BF/Personal Growth/PTG/meaning – BFS	Consider PTG and meaning as synonyms.
Optimism	[51]	PTG – PTGI	0
	[52]	PTG – PTGI	0
	[58]	PTG – PTGI; BF – qualitative question;	0
	[75]	PTG – PTGI	+
	[20]	PTG – PTGI	+
	[72]	PTG – PTGI	+

	[29]	PTG – PTGI	Pessimistics had greater PTG
Positive affect	[40]	PTG – PTGI	0
	[68]	PTG – PTGI	0
	[24]	PTG –PTGI	0
	[76]	PTG – Qualitative methods	+
	[14]	PTG – BFS	+
	[77]	PTG – PTGI	+
QoL/HRQoL	[52]	PTG – PTGI	+ between PTG and mental HRQoL
	[19]	PTG – PTGI; PG – PGIS	+
	[10]	PTG – PTGI	+
	[41]	PG – Impact of Cancer Scale	0
	[9]	PTG – PTGI; BF – BFS	0
	[72]	PTG – PTGI	0
Hope	[58]	PTG – PTGI; BF – qualitative question;	0
	[51]	PTG – PTGI	0
	[78]	PTG – PTGI	+
Spiritual WB	[20]	PTG – PTGI; BF-BFS	+
	[10]	PTG – PTGI	+
	[79]	PTG – PTGI	+
Psychological WB	[70]	PTG – PTGI	+

Happiness	[10]	PTG – PTGI	+
Gratitude	[34]	PTG – PTGI	+

*Note: 0 = no statistically significant relationship ; + = direct and statistically significant relationship ; - = inverse and statistically significant relationship.